

Appendix F
Emery & Garrett Groundwater, Inc.
Reports and Memoranda

- F.1 Interim Report IV for Installation of Site L Wells**
 - F.1.1 Lithologic Logs and Well Construction Diagrams for Monitoring Wells at Site L**
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 - F.1.3 Falling and Rising Head Tests Compiled Data for Monitoring Wells**
- F.2 Memorandum—Transition of Bedrock to Saprolite in the Rocks Underlying the Loudoun County Landfill and Site L**
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Revised, March 4, 1993

LOUDOUN COUNTY LANDFILL -- MEMO TO MARTY REIF (CH2M HILL)

Revised from 2/2/93 to 3/5/93

WELL #	DEPTH TO BEDROCK	TD	APPROX. THICKNESS TRANSITION ZONE	WATER LEVEL	YIELD/COMMENTS
			(Bedrock-Saprolite Interface)		

NEW WELLS (Early Data -- Drilled 1/25/93-2/3/93)

BR#1 (L-26)	162'	175'	3' (159'-162')	NM (not yet measured)	Bedrock cored from 165'-175'. Hit large volume of water at bedrock surface -- 80-100 gpm.
BR#2 (L-3D)	189'	193'	2-3'	NM	Lost circulation at 186' -- regained circulation at 191'. Bedrock reacts to HCL. Bedrock cored 189'-193'.
BR#3 (L-9Da)	NI	130'	--	NM	Lost circulation at 130'. Blew 200 gpm out of DW-20.
BR#4 (L-9Db)	128'	139'	2-4'	68.20'	Moist cuttings at 35', at 50' cuttings are dry, intercepted water at 125'. Significant water bearing zone between 126'-128' yielding 50+ gpm. Bedrock cored between 132'-139'.
BR#5 (L-13D)	202.5'	213.30'	198'-202.5' (4-5')	NM	Minor water intercepted at bedrock surface. Lost circulation at 185' and again at 194'-202.5'. Well cored from 202.5'-213.30'. No yield estimate could be obtained. Bedrock reacts to HCL.
BR#6 (Well #2)	165'	180'	3-6' (difficult drilling area)	NM	Minor water was intercepted at bedrock surface -- approx. 2 gpm. Bedrock reacts to HCL.
BR#7 (Well #4)	133'	150'	poorly defined (2-3')	NM	Water bearing zone intercepted in saprolite at 40'. Additional yield at bedrock surface, estimated yield 30+ gpm. Bedrock reacts to HCL.
BR#8 (Well #5)	72'	85'	2-3'	NM	Lost circulation between 70'-72'. Yield <1 gpm. Bedrock reacts to HCL.
BR#9 (Well #3)	41'	51'	2-4'	NM	Water-bearing zone intercepted at bedrock surface (30-50 gpm) at 40'-41'. Bedrock reacts to HCL.

Water level measured from top of casing 2/2/93 -- mid-day

L-9	24.25'
L-9Db	68.20'
DW-20	68.70'

Appendix F.4
Final Bedrock Boring Logs

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Legend for Rock Core Descriptions

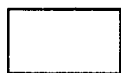
Symbols for Rock Types

Qtz = Quartzite
Qt = Vein quartz
Bk-Hm Qtz = Black hematite-rich quartzite
Mu Qtz = Muscovite-rich quartzite
Gs = Greenstone

Gsc = Greenschist
Ark = Arkose
Ss = Sandstone
St = Siltstone
Lm = Limonite

Bk-Sh = Black shale
GpSl = Graphite-rich slate
Ls = Limestone
Mb = Marble
ChG = Chlorite-bearing gneiss

Patterns for Rock Types



— Typical conglomerate with moderately to non-imbriated clasts.



— Typical conglomerate with moderately to strongly imbricated clasts.



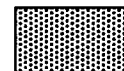
— Quartzite



— Arkose



— Greenstone



— Sandstone



— Siltstone

Fracture Types

Type-1 fracture = Fractures that occur along clast boundaries. The surface is fresh and void of secondary mineralization or weathering features.

Type-1a fracture = Same as Type-1 but having secondary mineralization, usually quartz and/or carbonate, and/or limonite.

Type-2 fracture = Fractures that transect matrix and clast boundaries.

Type-2a fracture = Same as Type-2 but having secondary mineralization.

Type-3 fracture = Bedding parallel fractures; those observed along boundaries of arkose beds.

Type-3a fracture = Same as Type-3 but having secondary mineralization.

Type-4 fracture = Fractures that occur within individual clasts and do not cross clast boundaries (ie. intra-clast fractures). Commonly filled with fine crystalline carbonate that is weathered to a vuggy texture.

Note: Fracture types 1-3 are likely to enhance the permeability of the rock.
Fracture type 4 does little to increase permeability, but does contribute to the porosity.

Emery & Garrett Groundwater Inc.

Project: Loudoun County Landfill
Driller: Groundwater Systems, Inc.
Geologist: James Brady
Date Drilled: 2/1/93 & 1/26/93
Boring: BR#1

Depth to Bedrock: 162'
Core Interval: 165'-175'
Core Diameter: NQ-2"
Core Recovered: 10'
RQD: 53.5%

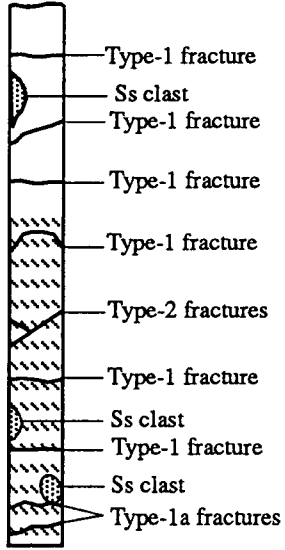
Depth (Feet)	Lithology (Horz. exaggeration approx. 10X)	Lithologic Description / Comments
	GENERAL DESCRIPTION: Conglomerate: very poorly sorted, w/ generally matrix supported clasts (0-35% of clasts touch) that are locally imbricated (35-45 degree dip), red-brown arkose matrix and distinct beds of arkose. Clasts are moderately imbricated throughout entire core. Matrix is poorly sorted, very fine- to coarse-grained, silt- to sand-sized quartz and feldspar grains with 1-5 mm, angular to subrounded clasts of limestone, quartzite, and greenstone. Carbonate cement is common. Clasts are generally sub-angular to rounded, and include gray-white quartzite, green-gray greenstone-greenschist, red-brown siltstone, variably colored sandstone, and limestone which is often impure (i.e., white brecciated clasts within a gray, carbonate-rich, silt-sand size quartz matrix). Arkose beds are red-brown, fine-medium grained, moderately sorted and graded. Bottom of beds have 2-10 mm imbricated clasts of Gsc, Qtz, St, and Ls which grade up to fine-medium grained arkose. Arkose beds are carbonate-rich and locally have fine carbonate veins.	
165.0 -	<p>Arkose, Quartzite, & Greenstone Clasts</p> <p>Type-3 fracture</p> <p>Type-1 fracture</p> <p>Arkose bed</p> <p>Type-1 fracture</p> <p>Type-1 fracture</p> <p>Type-1 fracture</p> <p>Arkose bed</p> <p>Type-3a fractures</p> <p>Type-1 fractures</p> <p>Type-1 fracture</p> <p>Type-2 fracture</p> <p>Ss clast</p> <p>Type-1a fracture</p> <p>Type-2 fracture</p> <p>Type-3 fracture</p> <p>Type-1 fractures</p> <p>End of 1st run/ Beginning of 2nd run</p> <p>Gs clast</p> <p>Type-1a fractures</p> <p>Ss clast</p> <p>Type-1 fracture</p> <p>Carbonate seam</p> <p>Type-1 fracture</p> <p>Type-1 fracture</p> <p>Type-2 fracture</p> <p>Type-2 fracture</p> <p>Type-1 fracture</p> <p>Ls clast</p> <p>Type-1a fracture</p> <p>Type-1 fracture</p>	165' - 166' Loose, weathered Qtz, Gs, and carbonate-free Ark clasts. Ark bed: top 5 mm of bed is punky weathered, carbonate-free. The lower part of bed is carbonate-rich.
.2 -		
.4 -		
.6 -		
.8 -		
166.0 -		166' - 167' Arkose bed: fine-medium grained, w/ 2-10 mm, angular clast of Ls and Gs. Conglomerate: 60% Clasts / 40% Matrix - <5% clasts touching. Clasts include: Ss, St, Qtz and Gs. Matrix has 2-4 mm clasts of Gs.
.2 -		
.4 -		
.6 -		
.8 -		
167.0 -		167' - 168' Conglomerate: 65% Clasts / 35% Matrix. Arkose bed as above, with bedding parallel fractures along fracture filled carbonate veins.
.2 -		
.4 -		
.6 -		
.8 -		
168.0 -		168' - 169' Bottom of arkose bed: 0.5-6 mm imbricated clasts of Gs, Ls and St. Conglomerate as above : 60% Clasts / 40% Matrix - 5% of clasts touching. Carbonate minerals in matrix.
.2 -		
.4 -		
.6 -		
.8 -		
169.0 -		169' - 170' 70% Clasts / 30% Matrix - 30% of clasts touching. Clast dominated by: Qtz, angular, impure Ls, and Mu Qtz. Clasts are imbricated (35-40 degree dip). Carbonate minerals in matrix.
.2 -		
.4 -		
.6 -		
.8 -		
170.0 -		170' - 171' Arkose bed: 0.5-6 mm, imbricated clasts of Gs, Ls, and St at base. Conglomerate as above : 65% Clasts / 35% Matrix. Matrix supported.
.2 -		
.4 -		
.6 -		
.8 -		
171.0 -		171' - 172' 60% Clasts / 40% Matrix. <5% clasts are touching. Clast dominated by: <1-3 cm elongate Gs; rounded Ss; <1 cm angular Ls; and <1-2 cm subangular St. Matrix is fine-grained arkose with 2-6 mm, angular clasts of Qtz, Ss, Ls and Gs. Lm on fracture surfaces.
.2 -		
.4 -		
.6 -		
.8 -		
172.0 -		172' - 173' Conglomerate with 60% Clasts / 40% Matrix. Carbonate seam/vein dips 60 degrees, apparently perpendicular to dip of imbrication fabric.
.2 -		
.4 -		
.6 -		
.8 -		
173.0 -		173' - 174' Conglomerate with 60% Clasts / 40% Matrix. Some clasts are bordered/cemented by crystalline carbonate.
.2 -		
.4 -		
.6 -		
.8 -		
174.0 -		174' - 175' Conglomerate with 55% Clasts / 45% Matrix. Lm coating on fracture surface.
.2 -		
.4 -		
.6 -		
.8 -		
175.0 -		

BR#1

Emery & Garrett Groundwater Inc.


Project: Loudoun County Landfill
Driller: Groundwater Systems, Inc.
Geologist: James Brady
Date Drilled: 1/27 - 1/30/93
Boring: BR#2

Depth to Bedrock: 189'
Core Interval: 189'-193'
Core Diameter: NQ-2"
Core Recovered: 4.0'
RQD: 91.6%

Depth (Feet)	Lithology (Horz. exaggeration approx. 10X)	Lithologic Description / Comments
<p>GENERAL DESCRIPTION: Conglomerate: very poorly sorted, w/ generally matrix supported clasts (0-35% of clasts touch) that are locally imbricated (35-45 degree dip), and red-brown arkose matrix. Clasts become increasing more imbricated from 190.6' to bottom of core. Matrix is poorly sorted, very fine- to coarse-grained, silt- to sand-sized quartz and feldspar grains with 1-5 mm, angular to subrounded clasts of limestone, quartzite, and greenstone. Carbonate cement is common. Clasts are generally sub-angular to rounded and include gray-white quartzite, green-gray greenstone-greenschist, red-brown siltstone, variable colored sandstone, marble, and limestone which is often impure; white brecciated clasts within a gray, carbonate-rich, silt-sand size quartz matrix.</p>		
189.0 - .2 - .4 - .6 - .8 - 190.0 - .2 - .4 - .6 - .8 - 191.0 - .2 - .4 - .6 - .8 - 192.0 - .2 - .4 - .6 - .8 - 193.0 -		<p>189' - 190' Conglomerate with 35% Clasts / 65% Matrix - Clasts include: 1-2 cm angular, impure Ls; white, rounded Qtz; 3-10 cm carbonate cemented quartz Ss; red-brown, angular St; and elongated, slightly foliated Gsc. Matrix is red-brown arkose with 2-4mm clasts of Gs, Qtz, and angular Ls.</p> <p>190' - 191' Conglomerate with 40% Clasts / 60% Matrix - 5% of clasts touching. Clasts dominated by: 1-2 cm rounded Ls; <1cm angular Ls, 1-5 cm elongated, subrounded Gs; carbonate-rich Ark, and Ss with fine carbonate veins. Matrix is same as above. Fracture at 190.7' dips approximately 45 degrees.</p> <p>191' - 192' Conglomerate with 40% Clasts / 60% Matrix - Clasts are imbricate and dip 35-40 degrees. Clasts dominated by: <1 cm rounded, foliated Mb; <1cm angular Ls, 2-4 cm, subrounded Gsc; and <1cm angular -rounded Qtz. Matrix as above. Fracture at 191.4' dips approximately 60 degrees; an apparently antithetic fracture dipping 30 degrees. Faint, strike-slip slickenlines on 60 degree fracture surface (ie. brittle fault).</p> <p>192' - 193' Conglomerate with 45% Clasts / 55% Matrix - 5% of clasts touching. Clast dominated by: <1-2 cm angular, impure Ls; 3-15 cm, rounded, Ss w/ Qt veins; 1-3 cm rounded Qtz; and <1 cm subrounded, elongate Gs. Matrix as above. Fractures at 192.8' and 192.9' have slight dissolution cavities on fracture surface.</p>
<p>Note: Only four feet of core was obtainable at this boring. The inner core barrel, when lowered down for the 2nd core run, became lodged within sediment that entered into the outer coring rods during removal of the inner core barrel after the first core run. Attempts were made to retrieve the inner barrel, but the sediment settled around and on top of the inner barrel preventing the retrieving tool to latch onto it. Rock coring was terminated at the approval of Mr. Richard Ryan (Loudoun County DER).</p>		

Project: Loudoun County Landfill
Driller: Groundwater Systems, Inc.
Geologist: John Brooks, PhD
Date Drilled: 1/29 to 2/2/93
Boring: BR#4

Depth to Bedrock: 128'
Core Interval: 132'-139'
Core Diameter: NQ-2"
Core Recovered: 7'
RQD: 28%

Depth (Feet)	Lithology (Horz. exaggeration approx. 10X)	Lithologic Description / Comments
GENERAL DESCRIPTION: Conglomerate: very poorly sorted, w/ generally matrix supported clasts (0-35% of clasts touch) and red-brown arkose matrix. Matrix is poorly sorted, very fine- to coarse-grained, silt to sand sized quartz and feldspar grains with 1-5 mm, angular to subrounded clasts of limestone, quartzite, and greenstone. Carbonate cement is common. Clasts are generally sub-angular to rounded and include gray-white quartzite, green-gray greenstone-greenschist, red-brown siltstone, variably colored sandstone, and limestone which is often impure (i.e., white brecciated clasts within a gray, carbonate-rich, silt-sand size quartz matrix).		
132.0 -		132'-133'
.2 -		Conglomerate with 70% Clasts / 30% Matrix - Clasts include: Gs, Ss, Qtz and up to 3 cm Ls. Matrix is fine grained arkose w/ angular Ls clasts; and carbonate.
.4 -		
.6 -		
.8 -		
133.0 -		
.2 -		
.4 -		
.6 -		Conglomerate with 70% Clasts / 30% Matrix - Clasts include: 2-10 cm Qtz (some biotite-rich). Clasts increase in size at 130'. Matrix is arkose with carbonate locally absent.
.8 -		
134.0 -		
.2 -		
.4 -		
.6 -		
.8 -		
135.0 -		Core is mostly loose clasts and weathered, vuggy conglomerate. Steeply dipping side of core section may be a sub-vertical fracture. Elongate vuggy area occurs on surface of fracture. Distinct vuggy zone along Qtz clasts at 134.2'. Clasts include: <1-6 cm Qtz, Gs, Ls, and St. Carbonate in matrix.
.2 -		
.4 -		
.6 -		
.8 -		
136.0 -		
.2 -		
.4 -		Conglomerate as above. This section of core has several weathered, vuggy areas. Vugs are locally coated with carbonate and Lm. Carbonate is locally absent in matrix. Fracture at 135.8' has crystalline carbonate coating on fracture surface.
.6 -		
.8 -		
137.0 -		
.2 -		
.4 -		
.6 -		
.8 -		Core dominated by loose, subrounded to rounded clasts with no matrix material. Drill bit dropped abruptly within this zone.
138.0 -		
.2 -		
.4 -		
.6 -		
.8 -		
139.0 -		

Emery & Garrett Groundwater Inc.

Project: Loudoun County Landfill
Driller: Groundwater Systems
Geologist: James Brady
Date Drilled: 1/25-28/93
Boring: BR#5

Depth to Bedrock: 202.5'
Core Interval: 202.5'-213.3'
Core Diameter: NQ-2"
Core Recovered: 10.8'
RQD: 93%


Depth (Feet)	Lithology (Horz. exaggeration approx. 10X)	Lithologic Description / Comments
GENERAL DESCRIPTION: Conglomerate: very poorly sorted, w/ generally matrix supported clasts (0-35% of clasts touch) with red-brown arkose matrix. Clasts are moderately imbricated throughout entire core. Matrix is poorly sorted, very fine- to coarse-grained, silt to sand sized quartz and feldspar grains with 1-5 mm angular to subrounded clasts of limestone, quartzite, and greenstone. Carbonate cement is common. Clasts are generally sub-angular to rounded and include gray-white quartzite, green-gray greenstone-greenschist, red-brown siltstone, variably colored sandstone, black shale, marble, and limestone which is often impure (ie. white brecciated clasts within a gray, carbonate-rich, silt-sand size quartz matrix). Decrease in clast size from 202.5-to 205' in core.		
202.4 - .6 - 8 - 203.0 - .2 - .4 - .6 - .8 - 204.0 - .2 - .4 - .6 - .8 - 205.0 - .2 - .4 - .6 - .8 - 206.0 - .2 - .4 - .6 - .8 - 207.0 - .2 - .4 - .6 - .8 - 208.0 - .2 - .4 - .6 - .8 - 209.0 - .2 - .4 - .6 - .8 - 210.0 - .2 - .4 - .6 - .8 - 211.0 - .2 - .4 - .6 - .8 - 212.0 - .2 - .4 - .6 - .8 - 213.0 - .2 - .4 -		<p>202.5' - 203' Conglomerate with 60% Clasts / 40% Matrix - Clasts include: Ss, St, Gs, Ark, Ls. Matrix has fine-grained Ark and angular Ls clasts.</p> <p>203' - 204' Conglomerate with 70% Clasts / 30% Matrix - Clasts include: carbonate cemented Ss, St, and Gs. Matrix has 2-4 mm clasts of Gs.</p> <p>204' - 205' Conglomerate with 60% Clasts / 40% Matrix - Clasts are dominated by: Ss and Gs (1-4 cm). Smaller clasts (<1cm) of carbonate cemented Ss, St, and ChG.</p> <p>205' - 206' Conglomerate with 65% Clasts / 35% Matrix - 20% of clasts touching. Clasts are dominated by: Ss, ChG, Qtz, impure Ls and St. Matrix as above.</p> <p>206' - 207' Conglomerate with 65% Clasts / 35% Matrix - 15% of clasts touching. Clasts are dominated by: Ss, ChG, Qtz, impure Ls and St. Large (15 cm) impure, light-dark Ls clast with thin carbonate veins.</p> <p>207' - 208' Conglomerate with 70% Clasts / 30% Matrix - 30% of clasts touching. Clasts are dominated by: Qtz, Ls, and GpSl. Clasts are imbricated (dipping about 35-40 degrees). Matrix is fine- to medium-grained arkose.</p> <p>208' - 209' Conglomerate with 75% Clasts / 25% Matrix. Clasts are dominated by: gray-green St/Ss, Qtz, Ls, and carbonate cemented Ss. Matrix is fine- to medium-grained arkose with 3-4 mm size clasts of Qtz and Gs.</p> <p>209' - 210' Conglomerate with 70% Clasts / 30% Matrix. Clast dominated by: Qtz, Gs, Bk-Sh with thin carbonate veins, and red St. Matrix is fine-grained arkose with 2-6 mm size clasts of Qtz, Ss, and Gs.</p> <p>210' - 211' Conglomerate with 65% Clasts / 35% Matrix. Clasts are dominated by: Qtz, Ls, carbonate cemented Ss and red St. Matrix is fine- to medium-grained arkose with 3-4 mm size clasts of Qtz, Gs, and St.</p> <p>211' - 212' Conglomerate with 60% Clasts / 40% Matrix. Clasts are dominated by: Gs, Qtz, Ls, and red St. Matrix has 2-5 mm size clasts of Qtz, Gs, and St.</p> <p>212' - 213' Same as above. Fracture at 212.5' has vuggy, carbonate and Qt-coated surface.</p> <p>213' - 213.3' Same as above.</p>

BR#5

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: Jim Brady Date Drilled: 1/26 & 2/1/93 Boring: BR#1	Static Water Level (gl): approx. 56' (2/1/93) Depth to bedrock: 162 Well Diameter: None Total Depth: 175' Yield: approx. 100 gpm
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DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	*SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
0					
2.5					
5					
7.5					
10					
12.5		10-12.5	23	Sap/Cng	Clasts 50% of rock (40% Qtz, 30% St, 30% Gs). Rock 95% weathered.
15					
17.5		15-17.5	**18	Sap/Cng	Clasts 50% of rock (75% Gs/St, 35% Qtz). Rock 85% weathered.
20					
22.5		20-22.5	22	Sap/Cng	Clasts 35% of rock (70% Gs/St, 30% Qtz). Rock 95% weathered.
25					
27.5		25-27.5	**18	Sap/Cng	Clasts 60% of rock (80% Gs/St, 15% Qtz, 5% Sh). Rock 80% weathered.
30					
32.5		30-32.5	20	Sap/Cng	Clasts 65% of rock (65% Gs/St, 35% Qtz). Rock 85% weathered.
35					
37.5		35-37.5	**17	Sap/Cng	Clasts 40% of rock (75% Gs/St, 25% Qtz). Rock 90% weathered.
40					
42.5		40-42.5	18	Sap/Cng	Clasts 70% of rock (75% Gs/St, 25% Qtz). Rock 90% weathered.
45					
47.5		45-47.5	**17	Sap/Cng	Clasts 65% of rock (60% Gs/St 40% Qtz). Rock 90% weathered.
50					
52.5		50-52.5	**4	ND	Black, hematite-bearing quartzite clast.
55					
57.5		55-57.5	**12	Sap/Cng	Clasts 65% of rock (65% Gs/St, 25% Qtz, 10% Sh). Rock 80% weathered.
60					
62.5		60-62.5	**8	Sap/Cng	Clasts 70% of rock (60% Gs/St, 40% Qtz). Rock 80% weathered.
65					
67.5		65-67.5	**12	Sap/Cng	Clasts 95% of rock (70% St, 30% Qtz). Rock 85% weathered.
70					
72.5		70-72.5	**18	Sap/Cng	Clast 75% of rock (70% Gs/St, 30% Qtz). Rock 90% weathered.

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts are absent.

ND - not determined

* 24" split-spoon

** 18" split spoon


Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Gs=greenstone;

St=siltstone; Sh=shale

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
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(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: Jim Brady Date Drilled: 1/26 & 2/1/93 Boring: BR#1	Static Water Level (gl): approx. 56' (2/1/93) Depth to bedrock: 162 Well Diameter: None Total Depth: 175' Yield: approx. 100 gpm
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DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	*SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
75					
77.5		75-77.5	20	Sap/Cng	Clasts 65% of rock (50% St, 30% Gs, 20% Qtz). Rock 90% weathered.
80					
82.5		80-82.5	0	ND	No sample attempted.
85					
87.5		85-87.5	**16	Sap/Cng	Clasts 55% of rock (75% Gs/St, 15% Qtz, 10% Sh). Rock 80% weathered.
90					
92.5		90-92.5	22	Sap/Cng	Clasts 60% of rock (90% Gs/St, 10% Qtz). Rock 90% weathered.
95					
97.5		95-97.5	**16	Sap/Cng	Clasts 45% of rock (90% Gs/St, 10% Qtz). Rock 80% weathered.
100					
102.5					Boring unstable-collapsing at 50'-70'; no more sampling attempted.
105					
107.5					
110					
112.5					
115					
117.5					
120					
122.5					
125					
127.5					
130					
132.5					
135					
137.5					
140					
142.5					
145					
147.5					

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts are absent.

ND - not determined

* 24" split-spoon


** 18" split spoon


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DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	*SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
150					Very eruptive when blowing.
152.5					
155					
157.5					
160					159'-160 hit large volume of water (80-100 gpm). Very irregular drilling (hard-soft).
162.5					Bedrock at 162'. Collected rock chips (Qtz, Gs, St, ArkSs) no carbonate present.
165					165'-175' rock cored NQ-2". See description on separate sheet.
167.5					
170					
172.5					
175					

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts are absent.


 **CONGLOMERATE** - Red to red-brown, very poorly sorted conglomerate (Goose Creek Member of the Catharpin Formation) with sub-rounded, matrix supported clasts and carbonate cement. See EGGI report of November, 1992 for further discussion of these materials.

Qtz=quartzite; Gs=greenstone; St=siltstone; ArkSs=arkosic sandstone

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: Jim Brady Date Drilled: 1/27-30/93 Boring: BR#2	Static Water Level (toc): ND Depth to bedrock: 189' Well Diameter: None Total Depth: 193' Yield: ND
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DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	*SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
0					Geologic log from 0-75' should be similar to L-3. Split spoon samples recovered from 75' (overlap of two sample intervals in L-3) to 107.5'.
2.5					
5					
7.5					
10					
12.5					
15					
17.5					
20					
22.5					
25					Medium brown, silty-clayey saprolite with very weathered clasts of Gs and St and 10% Qtz.
27.5					Cuttings wet at 30'.
30					
32.5					
35					
37.5					
40					
42.5					Medium brown, silty-clayey saprolite with very weathered clasts of Gs and St and 20% Qtz.
45					
47.5					
50					Cuttings dry at 50'.
52.5					
55					
57.5					
60					
62.5					
65					
67.5					
70					Started circulating water to stabilize boring wall.
72.5					

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts are absent.


ND - not determined

Gs=greenstone; St=siltstone; Qtz=quartzite

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: Jim Brady Date Drilled: 1/27-30/93 Boring: BR#2	Static Water Level (toc): ND Depth to bedrock: 189' Well Diameter: None Total Depth: 193' Yield: ND
---	--

DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	*SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
75					
77.5		75-77.5	20	Sap/Cng	Clasts 55% of rock (60% Gs/St, 40% Qtz). Rock 85% weathered.
80					
82.5		80-82.5	20	Sap/Cng	Clasts 40% of rock (75% Gs/St, 25% Qtz). Rock 85% weathered.
85					
87.5		85-87.5	22	Sap/Cng	Clasts 30% of rock (60% Gs/St, 40% Qtz). Rock 90% weathered.
90					
92.5					
95					
97.5		95-97.5	23	Sap/Cng	Clasts 45% of rock (65% Gs/St, 35% Qtz). Rock 85% weathered.
100					
102.5					
105					
107.5		105-107.5	19	Sap/Cng	Clasts 45% of rock (70% Gs/St, 30% Qtz). Rock 85% weathered.
110					
112.5					Boring starting to collapse. 113'-120' sporadic, hard-soft drilling.
115					
117.5		115-117.5	0	ND	Recovered only collapse material from boring.
120					120'-126' soft drilling.
122.5					
125					126'-129' Hard drilling.
127.5					129'-131' Easier drilling.
130					131'-132' Very hard drilling, refusal with roller bit. STARTED CORING AT 132'.
132.5		132-144	<10**	Sap/Cng	Qtz clast with 60 degree fracture that separates clast into two pieces (Fe-oxide stain on fracture surface). Gs clasts (50% weathered) and clayey saprolite material.
135					
137.5					
140					
142.5					
145		144-148	<10**	Sap/Cng	Several clasts consisting of Bk-Hm Qtz, and variably weathered
147.5					St, Gs, and ArkSs. Small amount of clayey saprolite material.

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts are absent.

ND - not determined

* 24" split-spoon

** - 10' of NQ 2" core barrel

Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Bk-Hm Qtz=black, hematite-bearing quartzite; Gs=greenstone; ArkSs=arkosic sandstone; St=siltstone

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: Jim Brady Date Drilled: 1/27-30/93 Boring: BR#2	Static Water Level (toc): ND Depth to bedrock: 189' Well Diameter: None Total Depth: 193' Yield: ND
---	--

DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
150		148-158	<12**	Sap/Cng	Mostly clayey saprolite material, adhered to the sides of the core barrel. 90% Gs/St clasts with Mn stains on outer surface, 10% gray-white Qtz clasts.
152.5					
155					
157.5					
160					
162.5		158-189	12-16**	Sap/Cng	Clasts of Qtz, Ss, and Bk-Hm Qtz. No saprolite material. 164' Hard drilling for 6 inches.
165					
167.5					
170					
172.5					
175					
177.5					
180					
182.5					
185					
187.5	189-193	4 feet	Cng	186'-191' Lost circulation in core barrel. Bedrock at 189'. See core description on separate sheet. 193' End of boring.	
190					
192.5					
195					

SAPROLITE - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts are absent.

CONGLOMERATE-Red to red brown, very poorly sorted conglomerate (Goose Creek Member of the Catharpin Formation) with sub-rounded, matrix supported clasts and carbonate cement. See EGGI report of November, 1992 for further discussion of these materials.

ND - not determined


Sap=saprolite; Cng=conglomerate; Qtz=quartzite, Bk-Hm Qtz= black hematite-bearing quartzite; Gs=greenstone; Ss=sandstone; St=siltstone; Mn=Manganese

** - 10' of NQ 2" core barrel

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill	Static Water Level (toc): ND
Driller: Groundwater Systems, Inc.	Depth to bedrock: ND
Geologist: Jim Brady	Well Diameter: None
Date Drilled: 1/25/93	Total Depth: 130'
Boring: BR#3	Yield: ND

DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	*SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
0					Geologic log from 0-55' should be similar to L-9. Split spoon samples recovered from 55' (depth of last sample in L-9 is 75'-77.5') to 82.5'.
2.5					
5					
7.5					
10					
12.5					
15					
17.5					
20					
22.5					
25					Cuttings wet at 30'.
27.5					
30					
32.5					
35			cuttings	Sap/Cng	
37.5					
40					
42.5			cuttings	Sap/Cng	
45					
47.5					
50					50'-70' Drill rods are wet and muddy.
52.5					
55					
57.5		55-57.5	**16	Sap/Cng	
60					
62.5		60-62.5	20	Sap/Cng	
65					
67.5		65-67.5	**18	Sap/Cng	
70					
72.5		70-72.5	24	Sap/Cng	

 SAPROLITE - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts is absent.

ND - not determined

*24" split-spoon

**18" split-spoon


Sap=saprolite; Cng=conglomerate; Qtz=quartzite;

Gs=greenstone; St=siltstone

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: Jim Brady Date Drilled: 1/25/93 Boring: BR#3	Static Water Level (toc): ND Depth to bedrock: ND Well Diameter: None Total Depth: 130' Yield: ND
--	--

DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	*SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
75					
77.5		75-77.5	**18	Sap/Cng	Clasts 50% of rock (45% Gs, 30% St, 25% Qtz). Rock 85% weathered.
80					
82.5		80-82.5	24	Sap/Cng	Clasts 60% of rock (30% Gs, 30% St, 20% Qtz, 20% Bk-Hm Qtz). Rock 85% weathered.
85					
87.5					Boring too unstable to continue split-spoon sampling.
90					
92.5					
95					
97.5					
100					
102.5					
105					
107.5					
110					
112.5					
115					
117.5					
120					
122.5					
125					
127.5					
130					130' Lost circulation in boring. Started blowing >200 gpm out of DW-20 located approximately 50'-60' from this boring. Could not advance with drilling.

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts is absent.

ND - not determined

* 24" split-spoon


**18" split-spoon

Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Bk-Hm Qtz=black, hematite-bearing quartzite; Gs=greenstone; St=siltstone

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: Jim Brady Date Drilled: 1/29- 2/2/93 Boring: BR#4	Static Water Level (toc): ND Depth to bedrock: 128' Well Diameter: None Total Depth: 139' Yield: 70-100' gpm
---	---

DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	*SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
0					Geologic log from 0-82.5' should be similar to L-9 and BR#3. No split spoon samples recovered throughout entire boring. Cuttings were examined only, none submitted as samples except those of the bedrock surface.
2.5					
5					
7.5					
10					
12.5					
15					
17.5					
20					
22.5					
25					
27.5					
30					
32.5					
35			cuttings	Sap/Cng	Medium brown, silty-clayey saprolite with very weathered clasts of Gs and St moist at 35'.
37.5					
40					
42.5			cuttings	Sap/Cng	Medium brown, silty-clayey saprolite with very weathered clasts of Gs and St and 20% Qtz.
45					
47.5					
50				Sap/Cng	Cuttings as above but DRY at 50'.
52.5					
55					
57.5					
60					
62.5					
65				Sap/Cng	Chattery drilling, cuttings are as above with 40-50% Qtz.
67.5					Cuttings are damp at 67'.
70					Firm, chattery drilling at 70'
72.5					

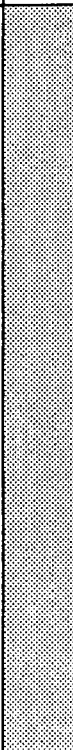
 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts is absent.


ND - not determined


Sap=saprolite; Cng=conglomerate; Qtz=quartzite;
Gs=greenstone; St=siltstone

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: Jim Brady Date Drilled: 1/29- 2/2/93 Boring: BR#4	Static Water Level (toc): ND Depth to bedrock: 128' Well Diameter: None Total Depth: 139' Yield: 70-100 gpm
---	--

DEPTH	WELL	SAMPLE	SAMPLE	ROCK	DESCRIPTION	
(FEET)	LOG	INT.	REC.	TYPE		
75					78'-84' Soft-fast drilling.	
77.5						
80						
82.5						
85					Sap/Cng	Cuttings are typical saprolite after conglomerate-damp/moist.
87.5						
90						
92.5					Sap/Cng	Cuttings becoming progressively more moist.
95						
97.5						
100						Soft drilling.
102.5						
105						
107.5						
110						
112.5						
115						
117.5						
120				Sap/Cng	Cuttings moist- competent Qtz clasts, Gs (80% weathered) and St (70% weathered).	
122.5						
125				Sap/Cng	Cuttings same as above.	
127.5				Sap/Cng	Hit large volume (70-100 gpm) of water at 126'-127'. Cuttings as above.	
130	Cng			128' Hit refusal with roller cone. Cuttings are competent clasts of Qtz, Gs, St, and arkosic matrix (positive HCl test). Boring deepened to 132' with a 6" air hammer, then cored from 132 to 139'.		
132.5						
135						
137.5						
140						

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts is absent.


 **CONGLOMERATE**-Red to red-brown, very poorly sorted conglomerate (Goose Creek Member of the Catharpin Formation) with sub-rounded, matrix supported clasts and carbonate cement. See EGGI report of November, 1992, for further discussion of these materials.

ND - not determined
Sap=saprolite; Cng=conglomerate; Qtz=quartzite;
Gs=greenstone; St=siltstone; HCl = Hydrochloric Acid

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: James Brady Date Drilled: 1/25-28/93 Boring: BR#5	Static Water Level (gl): approx. 21' (1/26/93) Depth to bedrock: 202.5' Well Diameter: None Total Depth: 213.3 Yield: ND
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DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	*SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
0					
2.5		2.5-5	16	Sap/Cng	Clasts 45% of rock (95% Gs/St, 5% Qtz). Rock 95% weathered.
5		5-7.5	15	Sap/Cng	Clasts 50% of rock (75% Gs/St, 15% Sc, 10% Qtz). Rock 95% weathered.
7.5		7.5-10	18	Sap/Cng	Clasts 40% of rock (75% Gs/St, 15% Sc, 10% Qtz). Rock 95% weathered.
10		10-12.5	20	Sap/Cng	Clasts 45% of rock (70% Gs/St, 25% Qtz, 5% Org). Rock 90% weathered.
12.5		12.5-15	20	Sap/Cng	Clasts 35% of rock (65% Gs/St, 20% Sc, 10% Qtz, 5% Org). Rock 90% weathered.
15		15-17.5	20	Sap/Cng	Clasts 40% of rock (70% Gs/St, 10% Sc, 15% Qtz, 5% Org). Rock 90% weathered.
17.5		17.5-20	18	Sap/Cng	Clasts 30% of rock (70% Gs, 25% Ss/St, 5% Qtz). Rock 90% weathered.
20		20-22.5	16	Sap/Cng	Clasts 10% of rock (60% St, 30% Qtz, 10% Gs). Rock 90% weathered.
22.5		22.5-25	19	Sap/Cng	Clasts 25% of rock (60% Gs, 20% Qtz, 20% St). Rock 85% weathered.
25		25-27.5	16	Sap/Cng	Clasts 30% of rock (50% St, 25% Qtz, 25% Gs). Rock 90% weathered.
27.5		27.5-30	17	Sap/Cng	Clasts 35% of rock (50% Gs, 25% St, 20% Qtz, 5% GpSl). Rock 90% weathered.
30		30-32.5	24	Sap/Cng	Clasts 10% of rock (40% Qtz, 25% Gs, 25% St, 10% Sc). Rock 90% weathered.
32.5		32.5-35	19	Sap/Cng	Clasts 15% of rock (55% Gs/St, 45% Qtz). Rock 90% weathered.
35		35-37.5	17	Sap/Cng	Clasts 20% of rock (40% Gs/St, 40% Qtz, 20% ArkSs). Rock 85% weathered.
37.5		37.5-40	19	Sap/Cng	Clasts 30% of rock (45% St, 30% Qtz, 20% Gs, 5% Mn-Ss). Rock 80% weathered.
40					
42.5					
45		45-47.5	15	Sap/Cng	Clasts 45% of rock (65% Gs/St, 20% Ss, 15% Bk-Hm Qtz). Rock 80% weathered.
47.5					
50		50-52.5	15	Sap/Cng	Clasts 70% of rock (95% Gs/St, 5% Org?). Rock 98% weathered.
52.5					
55		55-57.5	20	Sap/Cng	Clasts 30% of rock (40% St, 20% Mn-Ss, 20% Gs, 20% Qtz). Rock 85% weathered.
57.5					
60					
62.5					
65		65-67.5	15	Sap/Cng	Clasts 25% of rock (60% Gs/St, 40% Qtz). Rock 75% weathered.
67.5					
70		70-72.5	17	Sap/Cng	Clasts 30% of rock (65% Gs/St, 30% ArkSs, 5% Qtz). Rock 85% weathered.
72.5					Auger refusal at 70'. Saprolite becoming too firm/tight to advance with augers.
75					

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts is absent.

ND - not determined


* 24" split-spoon

Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Gs=greenstone; Bk-Hm Qtz= Black-hematite quartz; St=siltstone; ArkSs=arkosic sandstone; Mn-Ss= manganese stained sandstone; GpSl=graphite slate; Sc=schist (muscovite-rich); Org=organic (peat)

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: James Brady Date Drilled: 1/25-28/93 Boring: BR#5	Static Water Level (gl): approx. 21' (1/26/93) Depth to bedrock: 202.5' Well Diameter: None Total Depth: 213.3 Yield: ND
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DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
75					All following samples from NQ 2" core.
77.5					
80					
82.5		71-81	<12**	Sap/Cng	Mostly clasts- 40% Bk-Hm Qtz: competent, rounded; 40% Gs: rounded, slightly foliated, 75% weathered; 20% Qtz: gray-blue-white, rounded, competent. Minor clayey saprolite material; arkosic matrix, with highly weathered variably colored clayey pods with manganese stained surfaces.
85					
87.5					
90					
92.5					
95		81-94	<12**	Sap/Cng	All clasts- 50% Gs: subrounded, slightly foliated, 45% weathered; 25% Qtz: subrounded, gray-white, competent; 15% Ss: fine-med grained, rounded, moderate manganese staining; 10% St: red-red brown, angular, 70% weathered.
97.5					
100					
102.5					
105		94-104	<6**	Sap/Cng	Mostly clasts - 60% Gs: subrounded, slightly foliated, 40% weathered; 40 % Qtz: subround to round, gray-white, competent. Minor clayey saprolite material of 95% arkosic matrix: sand to clay size particles with 2-4 mm clasts of Gs, Qtz, and St.
107.5					
110					
112.5					
115		104-113	<12**	Sap/Cng	All clasts - 45% Qtz: subrounded, white bull quartz, and black, hematite bearing quartzite, 40% Gs: subrounded, gray-grey, yellow brown, slightly foliated, 35% weathered; 25% ArkSs: red-brown, fine grained, 20% weathered.
117.5					
120					
122.5					
125		113-123	<6**	Sap/Cng	Two clasts - Ss: brown-gray medium grained, maganese stained; Gs: green-yellow with dark brown Fe-oxide stained surface.
127.5					
130					
132.5		123-133	<6**	Sap/Cng	Mostly clasts - 60% Qtz, gray-white, subrounded, rounded, competent; 40% Gs: green-brown, massive, subrounded. Clayey saprolite material: red-brown matrix with variable colored clayey pods.
135					
137.5					
140					
142.5		133-143	<6**	Sap/Cng	Same as 123'-133' sample.
145					
147.5					

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts is absent.

ND - not determined

** 10' NQ-2" Core Barrel

Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Gs=greenstone;


St=siltstone; ArkSs=arkosic sandstone; Bk-Hm Qtz=black, hematite-bearing quartzite


EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill
Driller: Groundwater Systems, Inc.
Geologist: James Brady
Date Drilled: 1/25-28/93
Well #: BR#5

Static Water Level (gl): approx. 21' (1/26/93)
Depth to bedrock: 202.5'
Well Diameter: None
Total Depth: 213.3
Yield: ND

DEPTH (FEET)	WELL LOG	SAMPLE INT. (FEET)	SAMPLE REC. (INCHES)	ROCK TYPE	DESCRIPTION
150					
152.5		143-153	<6**	Sap/Cng	Mostly clasts - 60% St: subangular, red, red-brown, 95% weathered; 40% Gs: green-brown, massive, subrounded. Clayey saprolite material: red-brown matrix with variable colored clayey pods.
155					
157.5					
160					
162.5		153-163	<12**	Sap/Cng	Mostly clasts - 60% Gs: green-brown, slightly foliated, subrounded, brown Fe-oxide stains; 40% Qtz: subrounded, gray-white, competent. Clayey saprolite material: red-brown matrix with variable colored clayey pods.
165					
167.5					
170					
172.5		163-173	<12**	Sap/Cng	Mostly clasts - 60% Gs: green-brown, slightly foliated, subrounded, brown Fe-oxide stains; 30% Bk-Hm Qtz: medium grained, rounded, clear, quartz grains moderately cemented within a black-red hematite matrix; 10% GpSl: angular, cleaved, black shale, with graphite coating on cleavage planes. Clayey saprolite material.
175					
177.5					
180					
182.5					Lost circulation from 185'-192. Checked core barrel for sample recovery.
185		173-185	<12**	Sap/Cng	All clasts - 45% Qtz: 8" clasts broken into 2 pieces by a 60 deg. dipping fracture; 25% ArkSs: 15% weathered; 10% Gs: subrounded w/brown stain, 10% weathered; 5% St: red-brown angular, 25% weathered.
187.5					
190					
192.5					Regained circulation at 192; lost circulation at 194' to end of boring.
195		185-195	<12**	Sap/Cng	All clasts: One Ss clasts with 60 deg. dipping fracture dividing it into 2 pieces; smaller Bk-Hm Qtz, Qtz, ArkSs, and Gs clasts all faintly weathered. No saprolite material.
197.5					
200					
202.5					
205					
207.5		195-208	5.5 ft**	Cng	Hard drilling at 202.5'; interpreted to be bedrock. See bedrock core description on separate sheet.
210					
212.5		208-213.3	5.3 ft**	Cng	Bedrock - see core description on separate sheet.
215					

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts is absent.

 **CONGLOMERATE** - Red to red brown, very poorly sorted conglomerate (Goose Creek Member of the Catharpin Formation) with sub-rounded, matrix supported clasts and carbonate cement. See EGGI report of November, 1992, for further discussion of these materials.

ND - not determined

* - 24" split-spoon

** 10' NQ-2" core barrel

Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Gs=greenstone; St=siltstone

ArkSs=arkosic sandstone; Bk-Hm Qtz=black, hematite-bearing quartzite



GpSl=graphite slate

EMERY AND GARRETT GROUNDWATER, INC.
170 WAUKEWAN STREET
MEREDITH, NH 03253
(603) 279-4425

Project: Loudoun County Landfill Driller: Groundwater Systems, Inc. Geologist: K.C. Hardcastle, PhD Date Drilled: 1/30/93 Boring: BR #6	Static Water Level: approx. 73' Depth to bedrock: 165' Total Depth: 180' Yield: approx 2 gpm
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DEPTH (feet)	WELL LOG	ROCK TYPE (code)	DESCRIPTION
0			
10		Loam	Orange-brown, silty loam. Very slightly moist.
20		Sap	Orange-brown saprolite with 2% gravel size fragments of Qtz.
30		Sap	Medium brown otherwise as above.
40		Sap	As above.
50		Sap	As above with 5% Qtz fragments; slightly moist; 60% of cuttings are weathered Gs.
60		Sap	As above.
70		Sap	As above; 80% of clasts are weathered Gs/Gsc; saprolite after Goose Creek conglomerate.
80		Sap	WET apparently at about 73' (moist cuttings). Mostly weathered Gs fragments; < 5% Qtz.
90		Sap	No recovery.
100		Sap	Very moist-wet cuttings; material as above: saprolite after conglomerate.
110		Sap	No recovery.
120		Sap	As 100' with wet, muddy cuttings.
130		Sap	No recovery.
140		Sap	Mixed depth sample shows saprolite after conglomerate: 90% weathered Gs and < 5% Qtz.
150		Sap	No recovery.
160		Sap	No recovery. Bit dropped rapidly from 158' to 164'. Resistant drilling at 165' (bedrock). Continued resistant drilling to 180' with only poor sample recovery: most material similar to above.
170		Cng	Less than 10% of samples are partially weathered Gs, matrix material (without carbonate cement), and unweathered Qtz clasts.
180		Cng	As above. Attempted to wash and recover bedrock samples for 2 hours without good recovery.

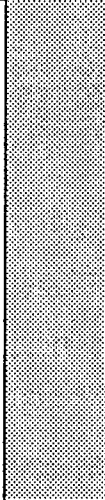
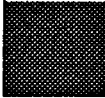
Cuttings of bedrock collected at 10 foot intervals. Hole abandoned after confirmation of bedrock.
No split-spoon or core samples were attempted.

-  **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts is absent.
-  **CONGLOMERATE** - Red to red brown, very poorly sorted conglomerate (Goose Creek Member of the Catharpin Formation) with sub-rounded, matrix supported clasts, and carbonate cement. See EGGI report of November, 1992, for further discussion of these materials.

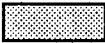

Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Gs=greenstone; Gsc=greenschist

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Project: Loudoun Landfill Driller: Groundwater Systems, Inc. Geologist: K.C. Hardcastle, PhD Date Drilled: 1/30 & 2/1/93 Boring: BR #7	Static Water Level: approx. 40' Depth to bedrock: 133' Total Depth: 150' Yield: 30+ gpm
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DEPTH (feet)	WELL LOG	ROCK TYPE (code)	DESCRIPTION
0		Sap	Medium red-brown, silty-clayey saprolite with very weathered Gs clasts and < 5% Qtz.
10		Sap	Damp cuttings then only slightly moist at 23'. Saprolite as above.
20		Sap	Medium-dark red-brown saprolite with moderately weathered Gs clasts and < 3% Qtz.
30		Sap	35-40' fast drilling, sticky damp cuttings. Saprolite as above.
40		Sap	As above.
50		Sap	As above.
60		Sap	As above.
70		Sap	As above.
80		Sap	As above. 86-88' fast drilling.
90		Sap	As above with 5-10% Qtz clast fragments. Slow, chatter drilling at 91'.
100		Sap	As above with 20% gray, angular St/Sh clasts.
110		Sap	As above-clasts becoming more competent.
120		Sap	As above.
130		Cng	130'-133' faster drilling. 133' resistant drilling (bedrock).
140		Cng	Continued resistant drilling to 150' with only poor sample recovery.
150		Cng	Less than 10% of samples are partially weathered Gs, matrix material (without carbonate), and competent Qtz clasts.

Cuttings of bedrock collected at 10 foot intervals. Hole abandoned after confirmation of bedrock.
No split-spoon or core samples were attempted.

-  **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts is absent.
-  **CONGLOMERATE** - Red to red brown, very poorly sorted conglomerate (Goose Creek Member of the Catharpin Formation) with sub-rounded, matrix supported clasts and carbonate cement. See EGGI report of November, 1992, for further discussion of these materials.

Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Gs=greenstone; St=siltstone; Sh=shale


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Project: Loudoun Landfill Driller: Groundwater Systems, Inc. Geologist: K.C. Hardcastle, PhD Date Drilled: 1/30/93 Boring: BR #8	Static Water Level: ND Depth to bedrock: 72' Total Depth: 85' Yield: < 1 gpm
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DEPTH (feet)	WELL LOG	ROCK TYPE (code)	DESCRIPTION
0			
10		Sap	Red-brown saprolite with about 30% white Qtz fragments and 70% variably, but mostly very weathered Gs/Gsc clast fragments.
20		Sap	As above.
30		Sap	As above; Gs clast fragments less weathered.
40		Sap	Tan-green-brown saprolite, otherwise as above; GS clasts only moderately weathered.
50		Sap	Medium brown-black-green Sap with dark green-black Gs/Qtz clasts slightly weathered.
60		Sap	As above; clasts > 80% grey-yellow-green, slightly weathered Gs.
70		Cng	70-72' lost air circulation. 72' hit bedrock: cuttings typical of the Goose Creek Member Conglomerate.
80		Cng	as above with 10% of the cuttings comprised of matrix material.
85		Cng	as above.

Cuttings of bedrock collected at 10 foot intervals. Hole abandoned after confirmation of bedrock.

No split-spoon or core samples were attempted.

 **SAPROLITE** - Medium red brown, silty to clayey material comprised of variably altered clasts of the underlying conglomerate (protolith). Bedding structure locally preserved. All carbonate in the matrix and limestone clasts are absent.

 **CONGLOMERATE** - Red to red brown, very poorly sorted conglomerate (Goose Creek Member of the Catharpin Formation) with sub-rounded, matrix supported clasts and carbonate cement. See EGGI report of November, 1992, for further discussion of these materials.

Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Gs=greenstone; Gsc=greenschist



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Project: Loudoun Landfill Driller: Groundwater Systems, Inc. Geologist: James Brady Date Drilled: 2/2/93 Boring: BR #9	Static Water Level: ND Depth to Bedrock/Boulder: 41' Total Depth: 51' Yield: 30-50 gpm
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DEPTH (feet)	WELL LOG	ROCK TYPE (code)	DESCRIPTION
0			
10		Sap	Red-brown saprolite with about 30% white Qtz fragments and 70% variably, but mostly very weathered Gs/St clast fragments.
20		Sap	As above.
30		Sap	As above; Gs/St clast fragments less weathered. Sporadic drilling at 37'.
40		Cng	Competent bedrock cuttings of Qtz, Gs, St, Ls and matrix material with carbonate.
50		Cng	Hit large volume of water (30-50 gpm) at 40'.

Cuttings of bedrock collected at 10 foot intervals. Hole abandoned after confirmation of bedrock.

No split-spoon or core samples were attempted.

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-  **CONGLOMERATE** - Red to red brown, very poorly sorted conglomerate (Goose Creek Member of the Catharpin Formation) with sub-rounded, matrix supported clasts, and carbonate cement. See EGGI report of November, 1992 for further discussion of these materials.

Sap=saprolite; Cng=conglomerate; Qtz=quartzite; Gs=greenstone; St=siltstone; Ls=limestone
 ND= not detected